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USPT	l1 and (surface adj5 profile)	176	L3
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USPT	(plasma adj5 process$3)	11426	L1

Document Number 7

Entry 7 of 13 File: USPT Jun 6, 1995

DOCUMENT-IDENTIFIER: US 5422139 A
TITLE: Method for a reactive surface treatment of a workpiece and a treatment chamber for practicing such method

BSPR:
Finally, the U.S. Pat. No. 4,297,162 patent document discloses to feed the treatment gas used in an RF-plasma-etching method from a plurality of openings to the surface to be treated located opposite of the surface, whereby the openings are located at different distances relative to the surface to be treated such to arrive at a desired etching profile at the surface of the workpiece. The gas and accordingly the products of the reaction of the reactive etching process are drawn out of the chamber by a vacuum pump connected to the chamber. The draw off conduit is located relative to the workpiece to be treated at the side opposite the infeed openings, such that the gas flow proceeds radially around the periphery of the workpiece to the draw off opening located centrally below the workpiece.

BSPR:
The German specification DE-OS-30 20 815 discloses a plasma supported reactive coating process in which the treatment gas is fed from a supply chamber through openings in one of the glow discharge electrodes into the treatment chamber proper between the electrodes and to lead the reaction products through the same openings out of the treatment chamber into the same supply chamber whereby the flow of the treatment gas to and into the treatment chamber and of the reaction products from and out of the treatment chamber back into the supply chamber proceeds based on a gas diffusion.

DRPR:
FIG. 8 is a sectional illustration of a preferred variant of an embodiment of an infeed/draw off opening array, to which may such be additionally connected as electrode, such as for a plasma etching or CVD process, or operated electrically neutral, such as for a pyrolytic CVD-process; and

DEPR:
Quite obviously the entire arrangement such as illustrated in FIGS. 8 and 9 can in case of the application in a plasma vacuum treatment process be connected electrically to a potential or as electrically grounded electrode work against a workpiece switched to a predetermined potential.

DEPL:
As a general rule in vacuum processes changes of this value can be registered up to about twice the distance 2 d between the openings.

Document Number 9

Entry 9 of 13 File: USPT Dec 14, 1993

DOCUMENT-IDENTIFIER: US 5270222 A
TITLE: Method and apparatus for semiconductor device fabrication diagnosis and prognosis

DEPR:
Various blocks shown in FIGS. 3a and 3b illustrate some suggested critical in-situ sensors (real-time as well as pre- and post-process sensors) for CVD processes (metals 52, dielectrics 54, amorphous and polycrystalline silicon 56), epitaxial growth 58, anisotropic plasma etch 60, silicide formation 62, dry surface cleaning 64, thermal oxidation/nitridation 66, ion implant processing 68, glass reflow 70, isotropic plasma etch 72, and resist processing 74. As an example, consider the critical sensor needs for metal CVD processes such as tungsten CVD using lamp-heated CVD modules. Again, a reliable temperature sensor is needed for real-time in-situ wafer temperature control (including uniformity control if a multi-zone illuminator is employed in conjunction with a multi-point temperature sensor).

DEPR:
FIGS. 5 and 6 illustrate examples of measurements of surface roughness values for a CVD tungsten film deposited on the semiconductor wafer and the unpolished backside surface of a semiconductor surface, respectively. The plot of FIG. 5 shows along the ordinant CVD tungsten RMS surface roughness ranging from approximately -3500 to -5000 .ANG. and along the abscissa lateral distance from left to right ranging from 0 to 200 .mu.m. As FIG. 5 illustrates, the CVD tungsten film has a rough surface due to its polycrystalline phase. FIG. 6 illustrates a similar surface roughness profile measurement of silicon wafer backside surface shown between 0 and -6000 .ANG. versus the semiconductor wafer backside lateral distance ranging from zero to approximately 2,000 .mu.m. The measurements of FIGS. 5 and 6 illustrate relatively rough surfaces on the CVD tungsten film as well as on the unpolished backside of the silicon wafer itself. It is these rough surfaces that affect coherent electromagnetic or optical beam reflectance and transmittance. Thus, by measuring the affect that surface roughness has on the specular or coherent surface reflectance and/or transmittance values, it is possible to measure the average or RMS surface roughness itself.

DEPR:
FIG. 21 illustrates a graph of expected average thickness versus expected film surface roughness for a given CVD process. It conceptually shows a range of expected thickness values for a semiconductor wafer material layer versus layer surface roughness. The graph of FIG. 21 can be used, for example, in a particular process to ensure that the expected or desired thickness values track with the actual or measured thickness values for a given value of surface roughness (extracted from surface scattering measurements). Thus, for a given deposition process and a given measurement of surface roughness, for example, at point A", average thickness of the polycrystalline layer should have fallen between the values in the range band of UL and LL indicating, respectively, acceptable upper limit and lower limit values. Point A" itself is out of range and should cause an alarm.

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Document Number 13

Entry 13 of 13 File: USPT May 5, 1987

DOCUMENT-IDENTIFIER: US 4663513 A
TITLE: Method and apparatus for monitoring laser processes

BSPR:
U.S. Pat. No. 4,532,404 noted that heat generated from a molten weld generated by an arc electrode was propagated as thermal waves through the bodies of respective metal pieces to be welded. Heat was generated in a radial manner and defined isothermal lines having progressively lowered values of temperature as the distance from the heating source increased. A pyrometer collected infrared rays emanating from the heated surfaces to define a temperature profile distribution at a time which reflected the real thermal dissipation condition prevailing ahead of the weld melt zone. A real time control system was used to adapt the operating characteristics of the welding electrode to environmental temperature variations or changes. The vertical position of the electrode was controlled in accordance with the monitored signals to compensate for vertical alignment. Other correction action such as displacement of the electrode over a colder edge or a tilting of the electrode tips could be effected.

BSPR:
The preceding and other objects of the present invention are achieved by providing a method for monitoring a laser process which delivers energy from a laser source to a material along a process path while producing a plasma or flame at a beam delivery point along the path. A window value is determined at which the laser process provides an acceptable energy transfer to the beam delivery point. Infrared radiation is detected along the process path at a point behind of and in close proximity to the beam delivery point. The detected infrared radiation is processed and a process signal produced. The process signal is compared to the window value and a signal is generated when the process signal is not within the range of the window.

BSPR:
The present invention provides a method and apparatus for monitoring various laser processes including but not limited to welding, cladding, transformation hardening and annealing. In one embodiment, the laser process is part of the complete work station. Depending on various parameters such as process, materials, conditions and the like, a signature value is determined for a process. Different signature values can be assigned for the same process depending on the parameters. Infrared radiation is detected at a point along a process seam behind where the process is currently practiced. The actual point selected is far enough away from the flame or plasma generated so that interference which results in an uneven non-uniform temperature profile, is established. This same point can not be too far from the plasma or flame because the temperature will be low and other factors will contribute to a non-uniform measurement.

DEPR:
The present invention provides a method and apparatus for monitoring a laser process. Energy from a laser source (a laser beam) is delivered to

a material such as a work-piece or part, along a process path. A plasma or flame, depending on the laser process, is produced at a beam delivery point along the path. First a window range of temperature, representative of acceptable bounds indicative of whether or not the laser process has produced a good part is determined. This signature essentially is a guide for comparison purposes enabling the establishment of whether or not the laser process has provided an acceptable energy transfer to a beam delivery point along the process path.

DEPR:
After the infrared radiation is detected it is processed to produce a process signal representative of the level of detected infrared radiation. The process signal is an electrical signal or series of signals which are representative of the temperature profile of the detection point. If the process is laser welding then the point is a somewhat cooled weld pool. The process signal is compared to the window value (non-manually) and a signal is generated if the process signal is outside the window range. Alternatively, a signal is generated only when the process signal falls outside the window range a predetermined number of times. This all depends on the particular laser process, types of material being processed, the reason for monitoring the laser process, the purpose for monitoring the process, and the like.

DEPR:
In FIG. 2 a laser beam 28 is incident upon a work piece 30 at a beam delivery point 32 and produces either a flame or plasma 34, depending on the process. Infrared radiation is detected along a line of sight at a detection point 36 which is positioned along a process path in the vicinity of and behind beam delivery point 32 at a position where the laser processing has already occured.

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☐ 1. Document ID: US 5874362 A

Entry 1 of 13 File: USPT Feb 23, 1999

US-PAT-NO: 5874362
DOCUMENT-IDENTIFIER: US 5874362 A

TITLE: Bromine and iodine etch process for silicon and silicides
DATE-ISSUED: February 23, 1999

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Wong; Jerry Yuen-Kui	Union City	CA	N/A	N/A
Wang; David Nin-Kou	Cupertino	CA	N/A	N/A
Chang; Mei	San Jose	CA	N/A	N/A
Mak; Alfred W. S.	Union City	CA	N/A	N/A
Maydan; Dan	Los Altos Hills	CA	N/A	N/A

US-CL-CURRENT: 438/719; 252/79.1, 438/710

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Image

☐ 2. Document ID: US 5869402 A

Entry 2 of 13 File: USPT Feb 9, 1999

US-PAT-NO: 5869402
DOCUMENT-IDENTIFIER: US 5869402 A

TITLE: Plasma generating and processing method and apparatus thereof
DATE-ISSUED: February 9, 1999

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Harafuji; Kenji	Osaka	N/A	N/A	JPX
Kubota; Masafumi	Osaka	N/A	N/A	JPX

US-CL-CURRENT: 438/729; 118/723E, 156/345, 216/71, 427/569

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Image

☐ 3. Document ID: US 5840592 A

Entry 3 of 13 File: USPT Nov 24, 1998

US-PAT-NO: 5840592
DOCUMENT-IDENTIFIER: US 5840592 A

TITLE: Method of improving the spectral response and dark current characteristics of an image gathering detector
DATE-ISSUED: November 24, 1998

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Russell; Stephen D.	San Diego	CA	N/A	N/A
Sexton; Douglas A.	Adair Village	OR	N/A	N/A
Kelley; Eugene P.	Spring Valley	CA	N/A	N/A
Reedy; Ronald E.	San Diego	CA	N/A	N/A

US-CL-CURRENT: 438/795; 148/DIG.93, 148/DIG.94, 438/60

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Image

☐ 4. Document ID: US 5843289 A

Entry 4 of 13 File: USPT Dec 1, 1998

US-PAT-NO: 5843289
DOCUMENT-IDENTIFIER: US 5843289 A

TITLE: Surface modification of medical implants
DATE-ISSUED: December 1, 1998

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Lee; Dosuk D.	Brookline	MA	N/A	N/A
Nagras; Atul	Somerville	MA	N/A	N/A

US-CL-CURRENT: 204/192.3; 204/192.32, 204/192.35, 216/67, 216/75, 216/76, 427/2.26

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Image

☐ 5. Document ID: US 5746929 A

Entry 5 of 13 File: USPT May 5, 1998

US-PAT-NO: 5746929
DOCUMENT-IDENTIFIER: US 5746929 A

TITLE: Process for structuring polymer films
DATE-ISSUED: May 5, 1998

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Schmidt; Walter	Zurich	N/A	N/A	CHX
Schmid; Hermann	Vaterstetten	N/A	N/A	CHX

US-CL-CURRENT: 216/59; 216/69

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Image

☐ 6. Document ID: US 5719495 A

Entry 6 of 13 File: USPT Feb 17, 1998

US-PAT-NO: 5719495
DOCUMENT-IDENTIFIER: US 5719495 A

TITLE: Apparatus for semiconductor device fabrication diagnosis and prognosis
DATE-ISSUED: February 17, 1998

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Moslehi; Mehrdad M.	Dallas	TX	N/A	N/A

US-CL-CURRENT: 324/158.1; 324/753, 324/765

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Image

7. Document ID: US 5422139 A

Entry 7 of 13 File: USPT Jun 6, 1995

US-PAT-NO: 5422139
DOCUMENT-IDENTIFIER: US 5422139 A

TITLE: Method for a reactive surface treatment of a workpiece and a treatment chamber for practicing such method
DATE-ISSUED: June 6, 1995

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Fischer; Heinrich	Furstentum	N/A	N/A	LIX

US-CL-CURRENT: 427/248.1; 118/715, 156/345, 216/58, 216/67, 427/569

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Image

8. Document ID: US 5399229 A

Entry 8 of 13 File: USPT Mar 21, 1995

US-PAT-NO: 5399229
DOCUMENT-IDENTIFIER: US 5399229 A

TITLE: System and method for monitoring and evaluating semiconductor wafer fabrication
DATE-ISSUED: March 21, 1995

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Stefani; Jerry A.	Richardson	TX	N/A	N/A
Butler; Stephanie W.	Plano	TX	N/A	N/A

US-CL-CURRENT: 438/7; 156/345, 438/8

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Image

9. Document ID: US 5270222 A

Entry 9 of 13 File: USPT Dec 14, 1993

US-PAT-NO: 5270222
DOCUMENT-IDENTIFIER: US 5270222 A

TITLE: Method and apparatus for semiconductor device fabrication diagnosis and prognosis
DATE-ISSUED: December 14, 1993

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Moslehi; Mehrdad M.	Dallas	TX	N/A	N/A

US-CL-CURRENT: 438/7; 356/433, 382/145

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Image

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10. Document ID: US 5231058 A

Entry 10 of 13 File: USPT Jul 27, 1993

US-PAT-NO: 5231058
DOCUMENT-IDENTIFIER: US 5231058 A

TITLE: Process for forming CVD film and semiconductor device
DATE-ISSUED: July 27, 1993

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Maeda; Kazuo	Tokyo	N/A	N/A	JPX
Tokumasu; Noboru	Tokyo	N/A	N/A	JPX
Nishimoto; Yuko	Tokyo	N/A	N/A	JPX

US-CL-CURRENT: 438/784; 216/18, 438/790

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Image

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11. Document ID: US 4808307 A

Entry 11 of 13 File: USPT Feb 28, 1989

US-PAT-NO: 4808307
DOCUMENT-IDENTIFIER: US 4808307 A

TITLE: Couette membrane filtration apparatus for separating suspended components in a fluid medium using high shear
DATE-ISSUED: February 28, 1989

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Fischel; Richard J.	Minneapolis	MN	N/A	N/A
Brumfield; Robert C.	Anaheim	CA	N/A	N/A

US-CL-CURRENT: 210/321.68; 210/321.87, 210/360.1, 422/101, 436/178, 96/204, 96/219

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Image

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12. Document ID: US 4755300 A

Entry 12 of 13 File: USPT Jul 5, 1988

US-PAT-NO: 4755300
DOCUMENT-IDENTIFIER: US 4755300 A

TITLE: Couette membrane filtration apparatus for separating suspended components in a fluid medium using high shear
DATE-ISSUED: July 5, 1988

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Fischel; Richard J.	Minneapolis	MN	N/A	N/A
Brumfield; Robert C.	Anaheim	CA	N/A	N/A

US-CL-CURRENT: 210/650; 210/321.68, 210/321.87, 210/782, 210/784, 422/101, 436/178

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Image

13. Document ID: US 4663513 A
Entry 13 of 13 File: USPT May 5, 1987

US-PAT-NO: 4663513
DOCUMENT-IDENTIFIER: US 4663513 A

TITLE: Method and apparatus for monitoring laser processes
DATE-ISSUED: May 5, 1987

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Webber; Tim	Berkeley	CA	N/A	N/A

US-CL-CURRENT: 219/121.6

Full | Title | Citation | Front | Review | Classification | Date | Reference | Claims | KWIC | Image

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